does take place, independent evidence of it should be obtainable in the case of optically active substances by a change in their rotatory power taking place when they are exposed to the X-rays, as it is well known that the ionised molecules of active compounds are possessed of very different activity from the undissociated molecules themselves. To put this point to the test, Mr. MacGregor and I have polarimetrically examined two optically active compounds, ethylic dibenzoylglycerate and methylic acetylglycerate, interposing a Crookes' focus tube between the polarising Nicol and the column of active liquid; but although the discharge was maintained in both cases for three-quarters of an hour, there was not the slightest change in the rotation observable. To facilitate the passage of the rays, we employed a thin microscope cover-glass to close the polarimeter tube at the end nearest to the Crookes' tube, and that the rays were actually traversing the column of active liquid was demonstrated by obtaining a photographic effect at the other extremity of the tube, whilst the efficiency of the Crookes' tube was further proved by the favourite test of the skeletal photograph of a hand, which yielded an impression of great sharpness and exhibiting a most remarkable amount of detail. It would appear, therefore, that the Röntgen rays either do not give rise to any ionisation at all, or that the concentration of the ions is so small as not to be detectable by means of a sensitive polarimeter. I have previously shown, in conjunction with Mr. Pickard (*Trans. Chem. Soc.*, 1896), that the active bodies in question exhibit what appears to be a process of ionisation when dissolved in certain organic solvents, which process is accompanied by a very conspicuous change in their rotatory power, so that they appeared to be specially adapted for testing this suggested influence of the X-rays.

Incidentally we have roughly tested the relative opacity of a number of organic compounds to these rays by spreading approximately equal thicknesses of each on a number of microscope cover-glasses, which were placed on a photographic plate enclosed in a black envelope, and then exposing them all simultaneously to a Crookes' tube placed a few inches above. Out of nearly forty organic compounds belonging to both the fatty and the aromatic series, the only ones exhibiting any marked opacity contained iodine, bromine, or chlorine, the iodine compounds being the most and the chlorine compounds the least opaque. Thus methyl iodide, ethyl bromide, ethylene iodide, ethylene bromide, monobromacetic acid, tribromacetic acid, bromobenzoic acid, and trimethylenebromide were very markedly opaque, and curiously monochloracetic acid was much more distinctly opaque than either dichlor- or trichlor-acetic acid.

Mason College, Birmingham. PERCY F. FRANKLAND.

Radiographs by Fluorescent Screens.

IT may perhaps interest those who occupy themselves in photographing with Röntgen rays to know that a very effective and rapid method is obtained when proceeding as I will explain. I had a piece of scheelite or native tungstate of calcium, such as occurs in a collection of minerals, crushed to a somewhat coarse powder, and made it into an emulsion with gelatine; this was applied in a consistent and uniform layer on a piece of stiff black paper, and after this was dried the surface showed numerous crystalline, glittering particles. The right condition for fluorescing was attained, as was evident, when a Crookes' tube in action was placed behind and looked at in the dark, though the luminosity was not so strong as with a screen covered with crystals of platinocyanide of barium. The paper, thus prepared, was simply laid down on a very sensitive photographic glass plate, with its fluorescent side of course in contact with the film; on the upper surface metallic objects or the fingers were put. Applying now Newton's focus tube (which, I may add, gave me excellent results in former experiments) with an induction coil, regulated to give sparks of five to six inches, I obtained sharply-defined radiographs of keys, &c., in twenty-five seconds, and of the fingers, showing the bones and metallic objects hidden between them and the plate, in ninety seconds, distinct enough to perceive even the eye in a needle that was put in the epidermis. I also tried the fluoride of calcium mentioned by Prof. Winkelmann, of Jena; but I perceived no fluorescence, perhaps because the powder was amorphous throughout. As scheelite is a very cheap mineral, large screens with fluorescent surfaces may be constructed at a trifling expense. L. BLEEKRODE.

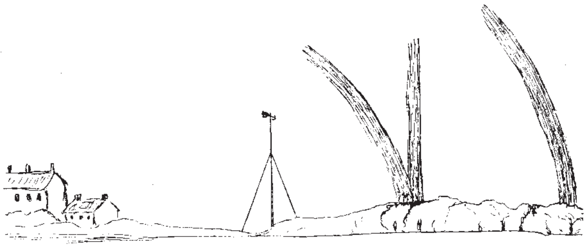
The Hague, April 6.

PERHAPS some of your readers who are practising electrography are not aware that those of them who possess a potassium platino-cyanide screen can diminish their exposures to a quarter of the time now necessary. I tried the experiment yesterday, and have been more than pleased with the results. The *modus operandi* is as follows. The screen is first laid on the dark-room table, platino-cyanide uppermost. A celluloid rapid sensitive film is then placed upon it, gelatine side downwards, and in contact with platino-cyanide. Upon the top of all is placed the hand or other object to be electrographed, and in contact with the celluloid. The whole, including screen, celluloid film, and object, are then raised from the table, and a light tight cloth bag drawn over them and properly secured. This arrangement, exposed under the Crookes' tube in the usual way, gives about four times the speed attainable without the reinforcing action of the screen. The "grain" of the screen shows; but if the salt has been finely powdered before preparing it, this is no great objection. Glass-sensitive plates are of course inadmissible.

Oaklands, Chard, April 13. J. WILLIAM GIFFORD.

Abnormal Rainbows.

ON March 22, about 6 p.m., a rainsquall was passing southeast of this station, and as the sun was shining clear and bright in the opposite quarter of the sky, a rainbow soon appeared. The colours were very brilliant, and a secondary bow was at once seen. From the base of the primary bow a perfectly straight vertical pillar arose of similar width, and the same colours, arranged in similar order from right to left; this was quite as distinct, and persisted quite as long as the usual rainbow, and the singular spectacle of the two rainbows with the vertical shaft attracted considerable attention, and was noticed by a large number of persons. It was described by several as the V-shaped rainbow. The sketch, made by my assistant, Mr. C. Grover, shows it as seen from the East Lodge, Rousdon, over the Coast Guard Station. C. E. PEEK.



Coast Guard Station.

Rousdon Observatory, Lyme Regis, Dorset.

Family Data.

A YEAR ago circulars were printed and cards issued with a view to the formation of a collection of simple measurements on parents and children, which would be of service in testing theories of heredity. In particular, such problems as are dealt with by me in a memoir on regression, heredity, and panmixia (printed in the *Phil. Trans.* of the current year), which treats of biparental inheritance, require statistics far more numerous than have been hitherto available. The measurements are of a simple character, involving but little elaboration, and all that is required is a willing father, mother, and one or more sons or daughters.

Three thousand cards and circulars were distributed, but experience has shown that general distribution is of little practical value. The cards are readily taken, but rarely returned. The only satisfactory method is to find a willing helper who is sufficiently conscious of the importance of the problems of heredity to distribute and collect himself ten or twelve data cards.

Up to the present I have obtained measurements on about 700 families. I am most anxious to reach at least 1000. May I make an appeal through NATURE for such helpers? I am prepared to send full directions and any number of cards to any of your readers who are willing to help. All I would ask is that

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they do not merely give the cards away, but themselves collect them and forward to me, as my experience has so fully demonstrated that not 5 per cent. of the recipients will take the trouble of returning them directly to me.

A collection of 1000 family measurements would be of immense value for testing various problems in heredity, and, if it be formed, I shall be only too glad that it should be ultimately deposited where it would be available for all future students of heredity.

It is, perhaps, needless to remark that the measurements required are of normal and not pathological characteristics, and no name except that of the recorder (in case of there being need of reference) is required.

All communications should be addressed to me at University College, London. Karl Pearson.

University College, London, April 10.

The Retinal Circulation.

The phenomenon of the retinal circulation, referred to in Mr. James W. Barrett's letter in Nature of April 2, was, I believe, first described by Dr. Robert Waring Darwin in 1786. He writes:—"By being accustomed to observe such small sensations in the eye, it is easy to see the circulation of the blood in this organ." . . . "It is sometimes necessary to rub the eyes with a certain degree of force after they are closed, and to hold the breath rather longer than is agreeable, which by accumulating more blood in the eye, facilitates the experiment." He further states that it depends on the state of health, is most distinct when the eye is fatigued, and is best seen by looking at the sky, shading the eyes with the hand.

I have myself seen it often when a boy under much the same conditions as your correspondent, viz. lying on my back looking up at the blue sky after severe exercise.

But about fifteen years ago I discovered a method of observing it far more perfectly. While calibrating a somewhat powerful spectroscope by measuring the Fraunhofer lines with a very narrow slit and direct sunlight, I noticed that when the region between G and H occupied the field of view, the retinal circulation showed so plainly as to inconvenience me. On slightly altering the focus, so as to get rid of the lines, I could see not only the corpuscles, but the walls of the capillaries themselves with great distinctness, especially when the eye began to be fatigued. With a sufficiently narrow slit the corpuscles were visible against the other parts of the spectrum, even the red, but they appeared as mere specks, and the outlines of the vessels could no longer be discerned. Judging from this that violet light was more important than a narrow slit, I tried last year the effect of various coloured media. Of these the most successful was ammonio-sulphate of copper. A six-ounce flask, filled with a solution of this substance, held close to the eye about a yard from an arc-lamp, enabled me to see the retinal circulation and some of the vessels, but not nearly so distinctly as with the violet light of the pure spectrum. George J. Burch.

Oxford.

JUPITER AND HIS PERIOD OF ROTATION.

A QUESTION which has recently been attracting considerable interest with regard to the greatest of our planets, Jupiter, relates to the determination of the time of rotation deduced from observations of markings on the visible surface of this planet's disc. The difficulty to be contended with here is that the appearance of the markings on the disc is always changing, and further great changes, even in short intervals of time, are noticeable. The chief characteristic features of the disc are the dark belts situated on each side of the equator, resembling to some extent the two belts of trade winds on the earth, which lie on either side of the belt of equatorial calms and rains. More minute scrutiny reveals to us other belts which are sometimes seen in considerable numbers, while their individual structure is by no means simple. These details are for the most part only temporary, and so quickly do changes take place, that the surface of the planet seldom, if ever, appears the same two nights together. Often spots are observed among these belts, which are generally of a more distinct nature than the usual markings; these are for the most part dark, but in some cases they are bright, round, and small, resembling the satellites as they travel across the primary's disc.

The extreme lack of constancy in the positions and forms of all the surface-markings has long ago taught us to cast aside the idea that we are looking at the surface of a rigid body. What we really see is the dense vapour and cloudlike formations between us and the real surface, encircling the whole planet from pole to pole, and always in a state of turmoil. This and other reasons have given us sufficient evidence to form some idea of the temperature of the planet itself, and it is now thought that the internal temperature is considerable, and probably sufficient to render the planet capable of shining to a small extent by its own light.

In consequence of the proper motion of several spots observed on Jupiter's surface and the primitive state of his atmosphere, the planet is said to resemble the sun to some extent. On account of these many points of similarity, Zöllner was led to believe that perhaps a similar law of rotation might here be in vogue which had been proved to hold good in the case of the sun by observations of spots on his surface. Lohse also, some time afterwards, after a minute discussion of all the available evidence, came to a similar conclusion, namely, that Jupiter in the region of his equator rotated quicker than in regions some distance from it.

Now this question is by no means so easy to settle as may seem at first sight. In the first place, in the cases of both the sun and this planet, the spots that are generally visible are confined to two belts north and south of the equator, while the equator and the poles are, for the most part, devoid of all such markings.

In the case of the sun, however, one need not necessarily be restricted to spot observation to determine the time of rotation near the poles, for we possess a very simple means of solving this problem by the application of Doppler's principle. The sun's limb on the east and west sides will be rotating towards and away from the observer, and an examination with the spectroscope of these regions will show us, by measuring the displacement of the lines in the spectrum from their normal positions, the velocities in the two directions. Curiously enough, both Crew and Dunér made investigations on this principle, and the results obtained were by no means the same, but, on the contrary, apparently antagonistic. The former, who observed the photosphere, found that for all latitudes the time of rotation was the same, while the latter, who examined the spots spectroscopically, obtained a decrease in the velocity as their distance from the equator increased. To explain these apparently contradictory results, Brester suggested that it seemed probable that Dunér observed the spectral lines of gases situated inside the photosphere, while Crew's observations were restricted in all probability to gases in those atmospheric layers which lie above the photosphere.

As yet no such observations near the poles of Jupiter have been attempted, although, as will be seen further on, this application of Doppler's principle has been employed for the region near the equator. Fortunately, however, in the year 1892 (October 10) a short dusky streak, oblong in shape, was observed by Stanley Williams near the north limb, extending nearly to north latitude 85°. Other similar streaks have been subsequently noticed, and frequent determinations of the times of mid-transit have been made. By good fortune the observers at the Lick Observatory had secured at the same time some good photographs of the planet, the surface-markings of which, on the negative, were sufficiently distinct for measurement.

A comparison of the times of rotation deduced from both the visual and photographic records seemed to give very satisfactory results, the mean periods differing only

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